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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/661,195	09/12/2003	Steven G. Goebel	8540G-000150	7227
27572	7590	05/18/2005	EXAMINER	
HARNESS, DICKEY & PIERCE, P.L.C. P.O. BOX 828 BLOOMFIELD HILLS, MI 48303			AUSTIN, MELISSA J	
			ART UNIT	PAPER NUMBER
			1745	

DATE MAILED: 05/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/661,195	GOEBEL, STEVEN G.	
	Examiner	Art Unit	
	Melissa Austin	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 14 March 2005.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-6 and 21-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-6, 21-30 is/are rejected.
- 7) Claim(s) 1-6, 21-30 is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 14 March 2005 is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: _____.

DETAILED ACTION

1. Claims 1-6, 21-30 are pending in this application after the preliminary amendment submitted 14 March 2005.

Specification

2. The amendment filed 14 March 2005 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: on Page 6 of applicant's response, amendment to specification paragraph [0027], "This configuration also allows the diffusion distance for the cathode side to be similar to that of a conventional configuration."

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Objections

3. Claims 1-6, 21-30 are objected to because of the following informalities: "membrane electrode assembly" should precede the first occurrence of "MEA" in claim 1. Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the

art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 21 and 23 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a sub-plate land region width **equal to** 2 times the width of the land region of the other sub-plate, does not reasonably provide enablement for a sub-plate land region width **equal to or greater than** 2 times the width of the land region of the other sub-plate. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims. See specification amended paragraph [0024].

6. Claims 22 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for a sub-plate land region width **equal to** 3 times the width of the land region of the other sub-plate, does not reasonably provide enablement for a sub-plate land region width **equal to or greater than** 3 times the width of the land region of the other sub-plate. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make or use the invention commensurate in scope with these claims. See specification amended paragraph [0027].

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

8. Claims 1-5, 24-28, and 30, are rejected under 35 U.S.C. 102(a) as being anticipated by Iwai et al. (WO 03/050905 A2). Iwai teaches a fuel cell with a pair of MEAs, each with an anode and cathode side, and a bipolar plate between the anode of one MEA and the cathode of the other MEA. The bipolar plate is formed of two sub-plates. The first sub-plate (22A) has a flow channel open to the anode of one MEA and a land region adjacent to the flow channel. The second sub-plate (22B) has a flow channel open to the cathode of the other MEA and a land region adjacent the flow channel. The first and second sub-plates are nested together to form a coolant flow channel between the two. The land region of either the first or second sub-plate has a width greater than the width of the flow channel of the other sub-plate. A plurality of coolant channels are formed by laterally centering the flow channels of the two sub-plates, and the surface area of the coolant flow channels is greater than the surface area of cathode reactant flow channel (see below). The second sub-plate includes a plurality of flow channels open to the cathode side which correspond to the flow channel of the first sub-plate open to the cathode side (this flow channel is interpreted to be the flow channel facing the cathode that is formed under the land region of the first sub-plate). The coolant flow path has a height dimension with a height dimension of the cathode flow path. The width of the land regions of the first and second sub-plates is equal, and the flow channels in the first and second sub-plates have similar cross sections. The width of the land region in either the first or second sub-plate is greater than the width of the flow channel in the same sub-plate. The second sub-plate abuts

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the land region of the first sub-plate, and vice versa. A wall extending from the land region of the first sub-plate abuts a wall extending from the second sub-plate. The flow channel of the first sub-plate is disposed against a land region of the second sub-plate, and vice versa. (Fig. 4; Page 9, II. 10 – Page 11, II. 21).

Figure 4 was used to calculate the surface area of the flow channels for coolant, anode, and cathode. The area formulas were found in *Pocket Book of Integrals and Mathematical Formulas* by Tallarida.

For the parallelogram coolant channels:

$$\text{Area} = 2ha\ell$$

where $h=\text{height}=2/5"$, $a=\text{base}=5/8"$, and ℓ is the length (see diagram below)

$$\text{Area} = 0.50\ell \text{ in}^2$$

For the trapezoidal anode channel:

$$\text{Area} = 0.5(a+b)h\ell$$

where $a=\text{base}=3/4"$, $b=\text{base}=1 \frac{1}{4}"$, $h=\text{height}=0.57"$, and ℓ is the length (see diagram below)

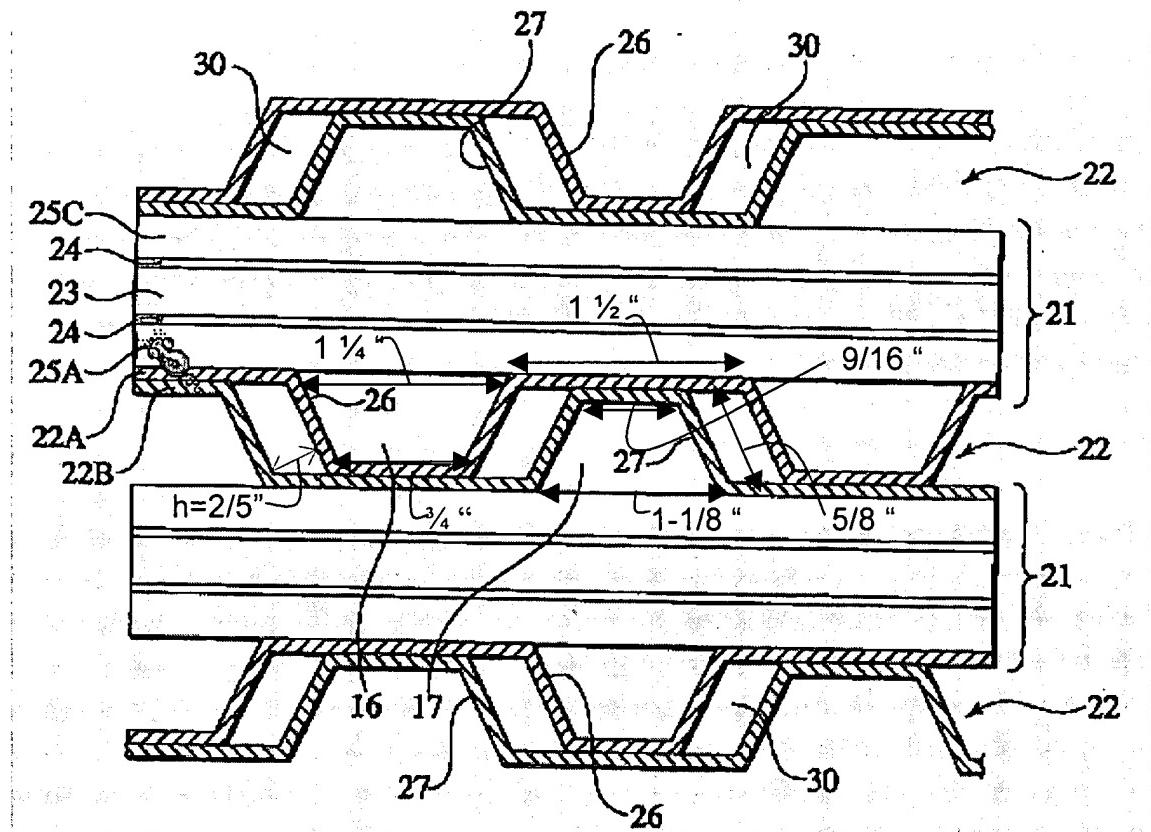
$$\text{Area} = 0.57\ell \text{ in}^2$$

For the trapezoidal cathode channel:

$$\text{Area} = 0.5(a+b)h\ell$$

where $a=\text{base}=9/16"$, $b=\text{base}=1 \frac{1}{8}"$, $h=\text{height}=0.57"$, and ℓ is the length (see diagram below)

$$\text{Area} = 0.48\ell \text{ in}^2$$



For all channels, ℓ is the same, so the surface area of the coolant channel is greater than the surface area of the cathode channel but is less than the surface area of the anode channel.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iwai et al. in view of Watkins et al. (U.S. Patent No. 4,988,583). Iwai teaches the elements of claim 1 as discussed above and incorporated herein; however, Iwai does not disclose a serpentine flow path. Watkins teaches a serpentine flow path for a flow channel of the anode or cathode. Such a flow path maximizes coverage of the electrode surface, and use of a single serpentine path ensures that no channeling will occur at any point in the operating area and no dead spots will form because water formed by the electrochemical reaction is continuously flushed from the operating surface of the electrode. (Fig. 2; Col. 4, ll. 29-55; Col. 6, ll. 56-Col. 7, ll. 8). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made would have included a serpentine flow path as taught by Watkins et al. for the flow channel open to either or both of the anode and cathode as taught by Iwai et al. in order to avoid dead spots on the electrode and channeling due to water build-up in the flow channel.

11. Claims 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwai et al. (WO 03/050905). Iwai teaches the elements of claim 1 as discussed above and incorporated herein. However, Iwai does not teach land regions in one sub-plate that are at least 2 or at least 3 times as wide as the flow channels in the other sub-plate. The sizes of the land region and the corresponding nested flow channel define the size of the coolant channel(s) formed under the land region, and the size of the coolant flow channel may be designed for optimum heat transfer. It would have been obvious to one of ordinary skill in the art at the time the invention was made to size the land region and flow channels to form coolant channels that would allow for most effective cooling of the

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fuel cell, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

12. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iwai et al. in view of Hammerschmidt et al. (US 2002/0150809). Iwai teaches the elements of claim 1 but fails to disclose a bipolar plate in which the land region of the first sub-plate has a width greater than that of the land region of the second sub-plate. Hammerschmidt teaches a bipolar plate in which the on sub-plate has a land region wider the land region of the other sub-plate. This prevents premature aging caused by residual oxygen remaining in the fuel cell after shut-down by limiting the volume of oxygen in the cathode channel and providing sufficient hydrogen in the anode channel to fully react with any oxygen remaining in the fuel cell, thus preventing oxidation of components of the fuel cell. (Fig. 2, Page 2, [0013]-[0016]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made would have sized the land regions of the sub-plates in the bipolar plate assembly as taught by Iwai et al. so that the land region of one sub-plate is wider than the land region of the other sub-plate in order to prevent oxidation of the fuel cell by excess oxygen remaining unreacted in the fuel cell.

Response to Amendment

13. The declaration filed on 14 March 2005 under 37 CFR 1.131 is sufficient to overcome the Carlstrom reference (US 2003/0224239).

Response to Arguments

14. Applicant's arguments with respect to claims 1-6 have been considered but are moot in view of the amendment to the claims and the new ground(s) of rejection.

Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melissa Austin whose telephone number is (571) 272-1247. The examiner can normally be reached on Monday - Thursday, alt. Friday, 7:15 AM - 4:15 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

mja
Melissa Austin
Patent Examiner
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PRIMARY EXAMINER

